

# SCIENCE AND SCIENCE FICTION.

## An Interview with Paul Davies

Ed Finn sat down to discuss Project Hieroglyph with physicist and cosmologist Paul Davies, director of the Beyond Center for Fundamental Concepts in Science at Arizona State University.

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I'm going to start with a very simple question:  
Why do you write books?

PD



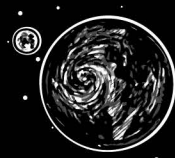
As a much younger man I came in for a lot of criticism from my peers. The feeling was that if you were writing what we might today call a popular book as opposed to a textbook, that this somehow meant that you couldn't be taken seriously as a scientist. Indeed, one colleague of mine said for every book you write, you should subtract ten from your journal publication list. That was the feeling in those days. Why did I do it? I think partly because I discovered quite unexpectedly that I had a talent for communicating in plain language, using analogies, mathematics, and so on, quite advanced and subtle concepts in physics in particular. People seemed to like it when I did it, and there's nothing like having an appreciative audience out there to make you carry on.

I'm such a passionate scientist. I find science so deeply exciting and important and significant that I want to tell people the good news. When I talk to nonscientists, then I realize that they have no idea about things like quantum reality or the Higgs boson or what happened before the big bang or any of these sorts of really important things or even stuff

about the nature of time that we've known for a hundred years. They're missing out on this vast universe of excitement. I just want to share this, my own sense of excitement, and not just excitement of science, but its significance for what it means to be human and what it means to be living in this universe. A bit of a sort of missionary zeal. Then it all changed in the 1980s, partly because physics, which is really my discipline, was beginning to wither.

Students found it hard. They found it too abstract. Girls seemed to hate it. The whole subject was really in decline. Universities began to wake up to the fact that if they had someone writing really good, exciting popular physics books that that might improve student recruitment. Then Stephen Hawking wrote his famous book, *A Brief History of Time*, reaching parts of the reading public that the rest of us had been unable to reach.

Suddenly it was okay to write popular books. Then all my colleagues began doing it. Now I think it's almost part of the job description. It's obviously not obligatory, and not everybody can do it or do it well. The days when it was frowned upon are long gone, and I'm thankful for that. Although I think there are probably rather too many popular science books on the market at the moment.

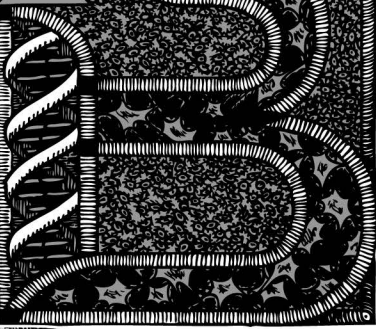






Would you say that's true primarily in physics or do you also see that happening in other scientific disciplines? Is there now a broader expectation of this kind of public communication?

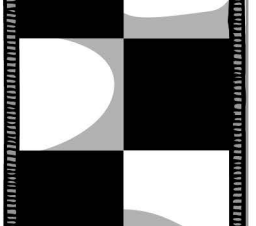
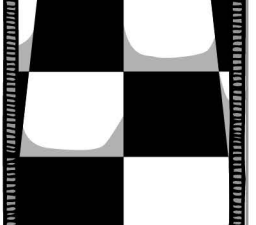
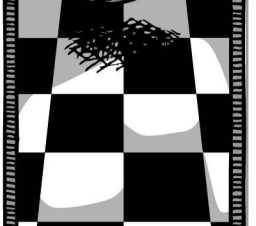
P.D.



biology has really stolen a march on physics. When I was first embarking

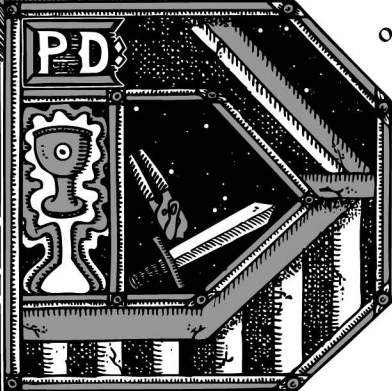
on this, there weren't very many people doing popular science. Most of those were from physics or cosmology backgrounds. It's easy to talk about astronomy and cosmology because you can discuss objects that are out there like stars and black holes. Biology was rather the poor relation. That changed, perhaps because of Richard Dawkins's books. He writes very well. He really did popularize biology. My first thought when I began to read Richard's books—which I think he just writes beautifully and I enjoy them immensely—my feeling was well, what's new? This is about Darwin's theory of evolution, it's 150 years old. [Laughing] Why is he writing about this stuff? It's old hat isn't it? But of course I guess it's anything but

old hat. Now when you look at lists of popular science books, they tend to be dominated by biology. Biologists have an advantage and a disadvantage. The advantage is that we can all imagine certain animals and plants. The concept isn't very abstract. The disadvantage is that at the molecular level it's so incredibly complex, and everything you want to talk about has some horrible unpronounceable name. [Laughing] It's only in recent years that they're coming around to doing what the physicists have long done [with naming]. For example, black holes. That's a pretty pithy explanation. In the beginning they used to be called totally gravitationally imploded stars or something. Biologists now talk about things like junk DNA or they give genes funny names like hedgehog and NANOG. I think they've learned that if you're trying to communicate something, it really does pay to have some pithy acronym or description.





Names have a lot of power, of course. So many names also come prepackaged with these metaphors—the black hole is a great example. It conveys very powerfully this particular image of what the thing is. There are so many popular science books out on the market now. What do you see as your responsibilities as a public communicator of science? How does one do it well?



on't pretend that doing science is ultimately for making money. There is this horrible trend among people who are trying to popularize science: Why are we looking for the Higgs boson? Well, maybe in a hundred years somebody will make a buck out of this. That's not why we're doing it. The reason that we do basic science is to understand how the universe works, and what our place is within the universe. It's a noble quest.

Not something you're going to devote 50 percent of the GDP to, but some small fraction of the GDP is

spent basically exploring how the universe is put together, what the underlying laws are, and how it began, and how it's going to end. All these things are just as important as—well, for previous generations were the great religious questions. People built the medieval cathedrals in Europe. I suppose there were a few people who said, "Well, what is this doing for the GDP? Where is the productivity in this, all these resources?"



Those people probably got their heads cut off.

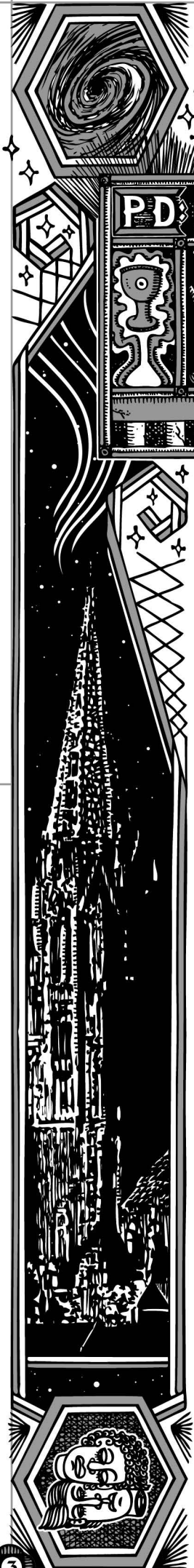


That's right. They were doing it because this was a great, collective human venture for trying to understand our place in nature. It was uplifting. It was giving people a sense of belonging and purpose. Science is exactly the same. It doesn't cost as much as the medieval cathedrals to do our type of science. I think science isn't just entertaining; it is part of what it means to be human.

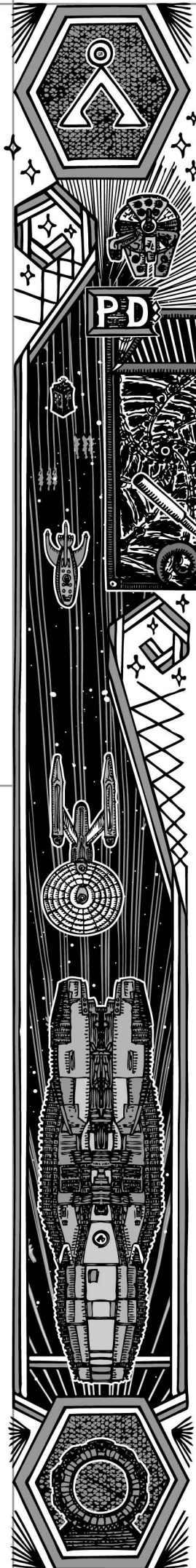
If science leads to some practical application, that's a bonus. The prime reason that we're doing basic science—not applied science but basic science—is to probe the secrets of nature, to figure it all out. And I think that's a wonderful thing to do. I think authors who communicate that sense of wonder—that we're doing it, not because we're trying to invent a better type of can opener, or something—that this really is part of the human adventure! That's what goes over well.

What doesn't go over so well, and my literary agent cautioned me against it right at the outset, is to take a subject and just give a sort of rundown of it, a survey of the latest thinking about data mining or something. That isn't going to do too well. If it's something like *chaos theory completely transforms the way that we understand the relationship between cause and effect*, that's pretty deep. Quantum reality shows there may be parallel worlds. That is attention grabbing.

There's got to be something in it that—and this touches on science fiction—takes us outside of our daily world into another realm; some people might say an Alice in Wonderland realm of weird and wonderful concepts. Things that are counterintuitive, defy common sense, really lie outside the scope of everyday experience. Yet we can still understand them. That's the magic of the human mind. We can go into territory where our imagination and our common sense completely desert us. And yet we can still make sense of it. Science has the power to reveal how the world works, even in areas where we could never guess it just by looking.







**EF**

I want to draw out two things that you just mentioned. First, the cathedral metaphor, which I think is very apt. Second, the sense of wonder. What I love about the idea of cathedrals is that they were literally building an architecture of the universe. It was a way to make sense of the world by putting a frame around it.

I think that is very much what the scientific endeavor is, more abstract at times, but in an equally sweeping and ambitious way. Science fiction becomes a kind of cathedral of the imagination. It's a space to do that playfully, to do it in an exploratory way.

Tell me how you try to capture and convey that sense of wonder as a writer and then let's use that as our bridge into science fiction, which is of course for many people a core engine for that experience of wonder in the world.

**P.D.**



he great advantage science fiction writers have over people like me is that they can bend the rules, sometimes quite a lot. They can make up different laws of physics or pretend that some of the things that we now cherish will be overthrown.

When I'm writing speculative science, I really try to be very careful about, first of all, being honest. Second, differentiating between speculations, which are firmly rooted in accepted understanding of science, and those that might require some future change or ideas that are being kicked around in academia, which are sort of taken semiseriously by the scientist concerned, but may never work out. Often people will say, "All this stuff about string

theory and so on. We can't take it seriously, can we?"

Well, the answer is maybe, to a certain extent. I always think it's really important if you're doing responsible science popularization to say, "This is a popular idea. It's a coherent idea. It's been worked on in a lot of detail. We know there's a lot of mathematical modeling of it, but there's not a shred of evidence at this stage that it's correct. It may turn out to be useful or may fade away." That's really important.

You can certainly push the boundaries. You don't have to remain exactly at a current state of knowledge. You can talk about ideas that challenge that. You can't just wave a magic wand and travel faster than light. If you're going to talk about faster-than-light travel, it's got to be done in this very cautious way.

**EF**

Much to the disappointment of many Hollywood screenwriters.

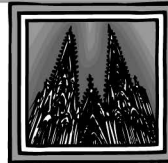
**P.D.**

Yes, if ever there is a spoiler for science fiction, it is the finite speed of light. It's a pretty big speed, but in astronomical terms it's very slow of course. It takes light one hundred thousand years to cross the galaxy. If you really believe nothing can go faster than light and you can't even send information faster than light, then that dissuades one from a lot of very popular science fiction scenarios. Now maybe one day we find out that this speed of light restriction is wrong, that there are ways of circumventing it. I personally don't think so, I think it's here to stay.

As a scientist I must always be prepared to be open-minded. The whole point is that nobody has the last word. All I can do is report to the best of my ability what is the current understanding of this or that subject area whilst being open to the fact that that may change in the future. If you take a sort of "anything goes" attitude—so I wrote a book recently called *The Eerie Silence* about the search for extraterrestrial intelligence. Well, a wonderland there of speculation. You could imagine all sorts of civilizations out there, all sorts of things going on and so on.

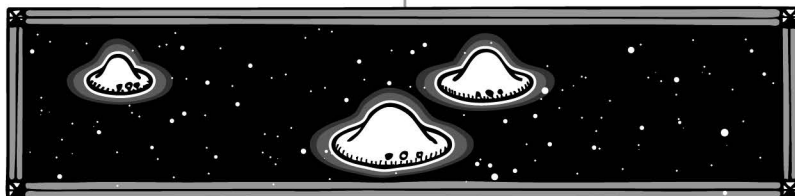
I am careful in the book to say, "Well, you know, if we can imagine super-civilizations as a possibility, why not invent civilizations that can travel faster than light? What effect would that have on looking for aliens?" What I point out is that really to do responsible speculative science you have to take the best understanding that we've got at this time in the knowledge that we may be proved wrong in the future.

If you take the attitude that we can make up anything, any laws, any old ideas that we want, then it becomes rather valueless: your speculation is as good as my speculation. It's got to be informed speculation, informed by the very best understanding we have of science in the full knowledge that we don't have the last word. There's more to come.







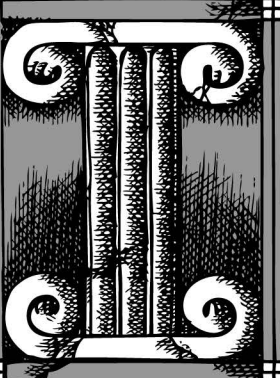


EE

When Ian McEwan was here visiting ASU, it was quite interesting to hear him talking about the choice that he made at a certain point in his career to pursue writing instead of a career in science, which was I think the alternative for him. He echoed your pleasure in seeing that there is more and more popular science writing. It has allowed him to remain involved in that discourse even though he can't do it professionally because he's too busy writing all those wonderful novels of his own.



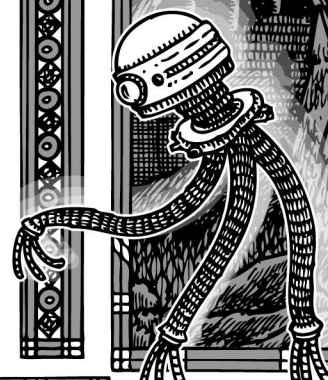
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think that is the point—that science

fiction writers are not just there to entertain, not just there to write books for scientists to read in their down-time. [Laughing] They really do have an important social role, first of all as part of communicating the science process. A lot of people, particularly young people, first get their glimpse of difficult ideas at the forefront of science from reading science fiction.

In science fiction you're creating a sort of imaginary but plausible world. That can be used as a setting to develop all sorts of social or even political messages. H. G. Wells's *The Time Machine* was really not a book about time travel. It was a book about what would happen if society continued to develop its rampant capitalism, and to develop in the far future the division into the haves and have-nots. It does provide that vehicle for social and political commentary. I guess that science fiction is as varied as any other genre. It'll be everything from an entertaining romp to something with much more serious sociological input.





I think that's right. The mission of Project Hieroglyph is really to find that sweet spot of science fiction right at the intersection of science, trying in this very deliberate way to put writers directly into contact with scientists and engineers and get them to engage with the latest cutting-edge ideas, the newest research. And still give them the freedom to write stories that explore social, ethical, and cultural questions.

I think that's what science fiction can do in a way that nonfiction science writing often can't: create that imagined world and work out human conflicts in a future landscape where some new discovery or new technology exists. That can be quite powerful. That's how the rest of us can follow along in a sense and start to play out these issues.

I like to think of science fiction as this sort of imagination lab where you can play out scenarios and work through all the different possible consequences in a way that is probably quite difficult when you are focusing on technical problems.

The premise of Project Hieroglyph, the initial call from Neal Stephenson to come up with more optimistic science fiction: I'm curious to hear whether you agree with that and how you see the state of our cultural relationship to the future?

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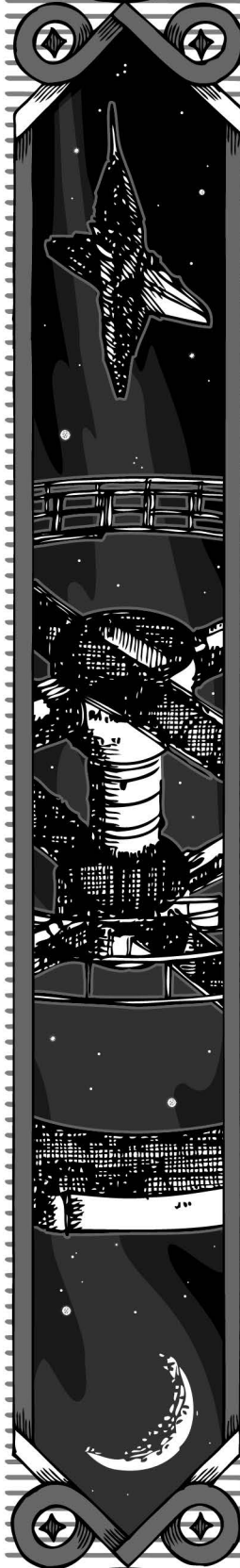


Most all futuristic fiction is dystopian. Maybe it always has been. I'm thinking back to H. G. Wells

and George Orwell—I don't recall that as science fiction, but I mean it's worse now than he predicted for 1984. That's all coming true. [Laughing] Do we see any utopian science fiction? Well, not a great deal. I mean, I think Arthur C. Clarke probably is a counterexample. It's not all utopian, but it's by no means doom and gloom. Science fiction can involve futuristic science, but also our same science but futuristic technology. Just taking what we see coming over the horizon and then imagining, taking it to some extreme in twenty years, fifty years, one hundred years—what would it be like? Anything that involves truly dramatic transformation of society could be viewed as dystopian, even if it's not. Imagine a future world, as we so often do—*Brave New*

World, in which the human reproductive process is managed very differently, and we're creating designer babies, transhumans, posthumans with carefully chosen attributes, controlled systematically by some sort of authority. It seems ghastly to us now. If it were to happen, I could well imagine that in another hundred years, people would say that our age was the awful one: rampant overpopulation and plundering of resources and people behaving in a ghastly manner. How much better to have engineered genomes and controlled population, where people are better adapted to their society and to what they can contribute and to what they need from it; and the whole thing is planned and organized.

They might regard that as the Utopia. What is good and bad? It very much depends on the age. There are things that we are doing now in our society that people are comfortable with that would have been regarded as horrific fifty years ago. It's too simple I think to just say that the future is, as told by science fiction, always bleak.







One of the best things that science fiction can do actually is complicate things a little bit or point out when we're leaning too heavily on certain assumptions. I think it's true in many ways that science fiction is a philosophical literature. The most outlandish, the most dangerous ideas that science fiction proposes often are really moral and philosophical questions rather than some radical new technological invention. It's ultimately about how we as humans use these things.

ou think ahead fifty years and probably the most profound changes will come from aspects of science and technology that we don't even know about yet. Or we might know about them, but we don't appreciate their significance. Time and again when I'm discussing these things about my own youth and reading books about the future, I think of the comics that I used to read and their images of cities in the year 2000 with people with jetpacks on our backs. They completely missed out on the information revolution, which was there, but it was just out of sight. People didn't understand the significance. That's the fun, isn't it, of trying to pick what's next?



That's a very interesting question. We are moving so quickly now in so many different arenas of discovery that we have a huge number of new ideas, tools, and systems that we have created, and we haven't realized what a tremendous impact they could have. That's one of the things that excites me the most about the premise of Project Hieroglyph: it's really almost science fiction of the present. What could we do now if we simply set our minds to it? Not relying on undiscovered technologies but simply reconfiguring or shifting the cultural frame to say, "This is important and here are these tools. Nobody's put them together yet, but you could really do this if you wanted to."



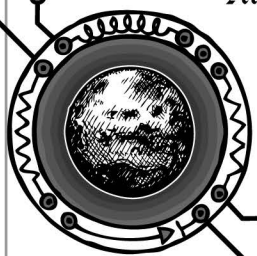
I like to speculate about what we could achieve with current science and technology and the commitment and resources. One that I've been banging on about for years is a one-way mission to Mars. We could set up a Mars colony now with current technology. We don't need some really futuristic thing. We could go to Mars. We have the ability to get there. We could send people there. They may not live as long as they would if they stay behind on Earth, but it's not a suicide mission. We could build Mars colonies starting now.

Is that science fiction? I don't know. I suppose it's conceivable, but at the moment it's fiction. I think what's standing in our way is simply having a good reason to do it, or for nations having the ability to pull together their resources. Most of my career was dominated by the Cold War and the arms race, particularly in physics. To a certain extent, biology. But big science was driven by the military.

Things like particle accelerators, which are very expensive, big projects, or the space program—these things were riding on the coattails of the military budget. They were regarded as, if not directly military, at least sort of part of a national virility contest: your technological prowess to intimidate the opposition. A lot of people spoke in the early days about the peace dividend.

The plan was when we stop spending this obscene amount of money on armaments, you could always spend on really useful stuff like health-care programs, and the nonmilitary science would absolutely flourish. The exact opposite occurred. The peace dividend turned out to be negative once the arms race faded away. Big science became very difficult to fund. It's a bit of a tragedy that humanity can't pool resources in the spirit of cooperation rather than competition.

The truth is you get more out of people by having a race or a competition than you do asking them to cooperate. It says something about human nature, and it's true of individuals and it's true of nations. It's well known that if you want to achieve something, a million-dollar budget, and it's not enough, it's a ten-million-dollar project, you create a million-dollar prize—now I'm thinking the X Prize. It's a great way to get people to go to Mars: Give them a prize.

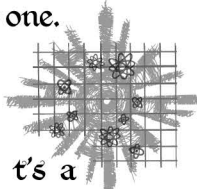
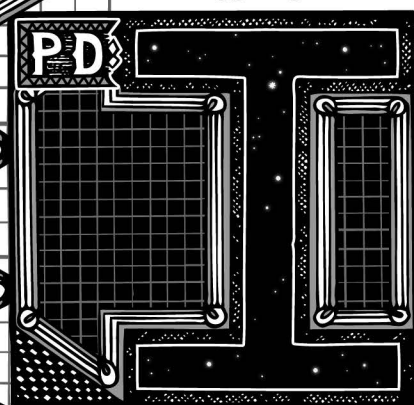


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It's a powerful motivator and it reminds me of the cathedrals. The Cold War provided this frame that made a rational story out of the universe. It wasn't a terribly happy story. It was a story of these two competing superpowers with nuclear missiles poised at each other's cities. But it was a story that made sense, that allowed everybody to pull together and focus on these things. It had those elements of competition and ideology and self-interest.

The Apollo missions were part of the Cold War. The space race was part of this broader military struggle. Of course we had Wernher von Braun and we had our rockets. We weren't just using them to study moon rocks. Yet there was also a beauty and a selfless sort of majesty to the space missions as well, in taking that step for mankind. I think you're quite right, those framing stories are so important. We seem to be struggling for a new one.

PD



t's a much more confused picture now. In our present society I think we can recognize

something—there's a deep malaise running through our own liberal democracy, Western society, and around the world. Ideological conflicts now are really between the world of traditional Islam and Western democracy, whereas previously it was communism versus capitalism.

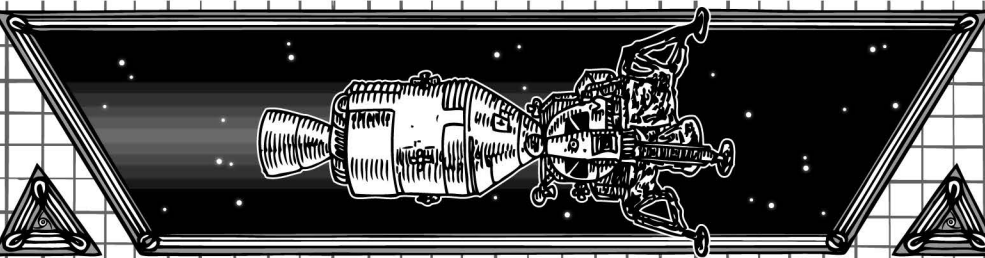
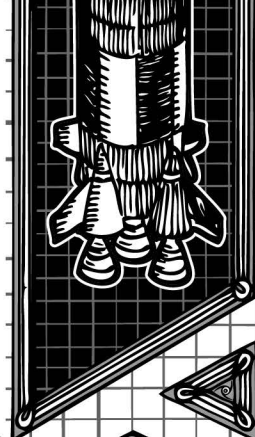
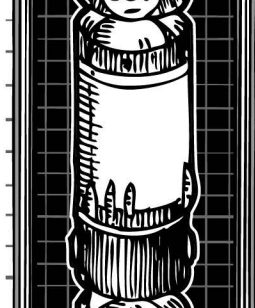
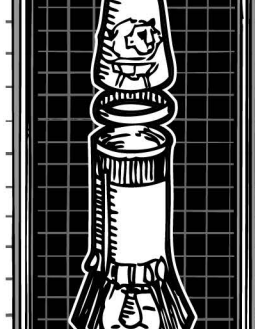
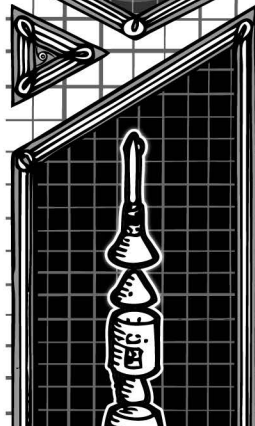
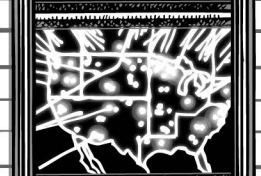
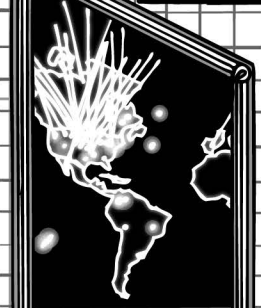
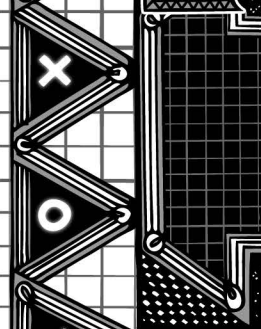
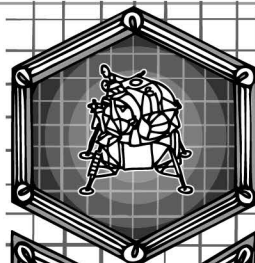
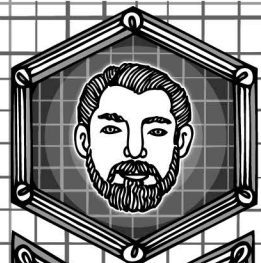
For a while people were talking about the New World Order with the end of the Cold War, that maybe it was now possible to have everybody integrated into some sort of common market, and everyone get wealthy together. Things are a lot better than they were, I have to say. People who tend to be gloomy about our present circumstances have forgotten what it was like, say, in the '70s or '80s. I think the world is better. Relatively speaking there is less

poverty; it doesn't mean there isn't some. Relatively speaking there's less.

What I see is really the fragmentation of society; it's no longer the case that we can get behind these simple narratives, where it seems like there is an obvious trajectory that we want to follow. And then, if we try hard enough and are not derailed by the opposition or the alternative ideology, we'll get there.

When I talk to young people, they don't seem to have a real grasp of who they are, or what sort of community they're in, or where it's going. There's a terrible sense of living for the moment, of just instant gratification and no real commitment to a well-charted future. Maybe this is where science fiction really can help by giving some sort of structure to the way forward, and getting away from this notion of living in the here and the now and not bothering to plan further down the track.

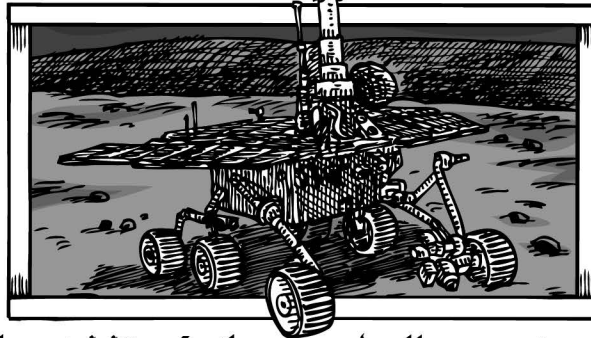
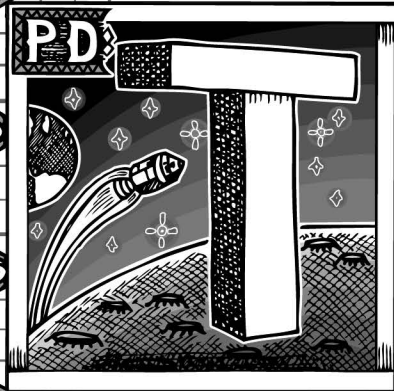
I'm talking primarily of course about liberal Western democracies. It may be totally different in China.



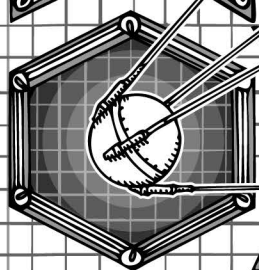
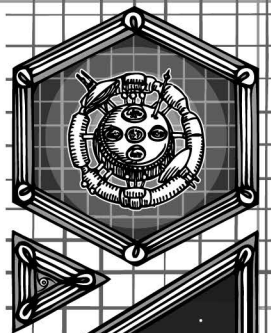
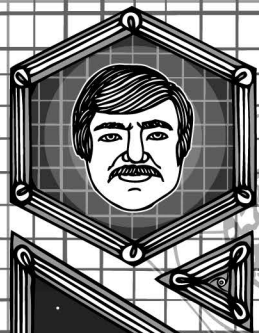
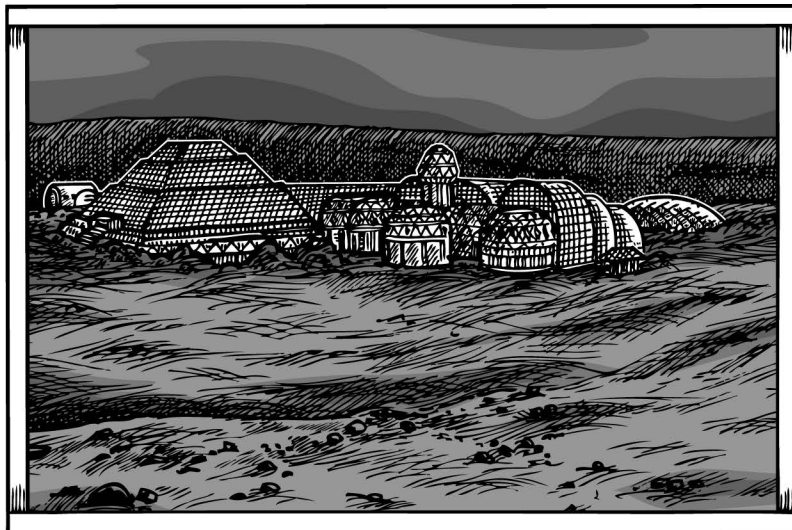




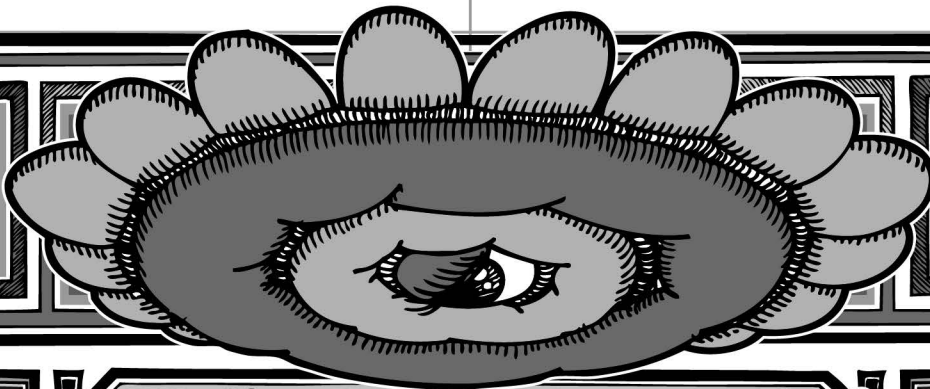
China is just beginning to develop a new wave of science fiction. As a cultural concept, it's of course very different. Soviet science fiction was fascinating if you look at something like Tarkovsky's *Solaris*. The way that you imagine the future is always a reflection of the present. We need to build this pathway forward, and not to the distant future, which is still the same as it was fifty years ago. What's a goal that we could accomplish in the next ten years or twenty years? That was something that we had in previous generations. That was something that the cathedral builders had because they knew that ultimately they were going to finish building the cathedral, and it was going to be better than the cathedral in the city down the road.



he spirit of the Apollo program was that it was deliverable within a human lifetime, and a big commitment, and everybody got behind it. It's easy to imagine doing things like that now. I mean, I've mentioned there's one way to Mars, but that's maybe a bit harebrained. We could imagine great projects here on Earth that we could do—if there was the commitment, we could do it. What these projects need to do is, in my view, to be unifying and not part of a national competition. What we need is great projects that can bring people together.







Roy Wasson Valle was born in Mexico City and lived in Cuernavaca, Mexico until the age of 11, when his family moved to Prescott, AZ. In 2003, he received a Bachelor of Fine Arts in Sculpture from Arizona State University. His work has been exhibited in several individual shows in Phoenix, AZ. He has also participated in invitational group shows at a variety of venues, including the Arizona Museum for Youth, the Mesa Arts Center, and the Phoenix Art Museum. He was hired to create all of the artwork for a computer game called Word Realms. In 2014, Roy and his wife and collaborator Koryn Woodward created Camp Dreamtree, an interactive art camp installation, at the Scottsdale Public Library. They are currently adapting Camp Dreamtree into a traveling installation, while creating additional public art projects and gallery shows. They have a little girl together.

See more of Roy's work at <http://instagram.com/rwvart>, or follow him on Twitter at @RWVart.

